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मानक

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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 11226 (1993): Leather safety footwear having direct moulded rubber sole [CHD 19: Footwear]



“ज्ञान से एक नये भारत का निर्माण”

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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
सीधे संचकित तले के साथ चमड़े के सुरक्षा जूते — विशिष्ट
(पहला पुनरीक्षण)

Indian Standard

LEATHER SAFETY FOOTWEAR HAVING
DIRECT MOULDED RUBBER SOLE —
SPECIFICATION

(*First Revision*)

First Reprint MARCH 1999

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

The safety footwear mentioned in this draft standard are manufactured either by direct vulcanizing or by direct moulding process and is known as having direct moulded rubber sole. As the name indicates, when vulcanization/moulding process is over and footwear is taken out from the machine, the solidified sole material adheres firmly to the footwear bottom. Three designs, namely, ankle boots, Jodhpuri shoes and Derby shoes fitted with protective steel toe caps have been incorporated in the standard.

The Derby/Jodhpuri shoes and ankle boots with padded collar, hook/ring lacing, etc, or similar designs other than these footwears may be accepted as agreed to between the manufacturer and purchaser.

The safety footwear covered in this draft standard may be used by the workers of mines, refineries, fertilizer plants, or places where working surface is oily.

The footwear may be made on lasts in accordance with sizes and fittings given in IS 1638 : 1969. Sizes and fittings of footwear (*first revision*) and IS 5520 : 1969 Lasts, wooden, for heavy duty boots in terms of dimensional requirements. The shape and design of the boots/shoes may be as agreed to between the purchaser and the supplier. Recommendations given in IS 6519 : 1971 Code of practice for selection, care and repair of safety footwear should be followed for storage and use of safety footwear.

In this revision the following requirements have been modified:

- a) material for insole;
- b) width of cotton *NEWAR*;
- c) performance requirement of steel toe caps;
- d) elongation at break of oil resistant rubber sole;
- e) oil resistance properties of soles;
- f) thickness of soles and heels of shoes;
- g) thickness of heel filler for Derby shoes;
- h) variety of cotton threads; and
- j) distance of jugloop from the top of the quarter.

Further alternative materials/methods for manufacturing of direct moulded rubber boots have been prescribed in this revision for the following:

- a) threads for upper stitching;
- b) iron shanks;
- c) cotton *NEWAR*; and
- d) cotton laces.

In addition to the above the following two new requirements have been included for rubber soles without oil resistant properties:

- a) tensile strength; and
- b) elongation at break.

The composition of the committee responsible for formulation of this standard is given at Annex F.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 JULY 1994
TO
IS 11226 : 1993 LEATHER SAFETY FOOTWEAR
HAVING DIRECT MOULDED RUBBER SOLE —
SPECIFICATION

(First Revision)

(Foreword, para 1, line 1) — Insert '(First Revision)' between the words 'Standard' and 'was'.

(Para 2, line 1) — Delete the word 'draft'.

(Para 2, line 1) — Insert the following sentence before the first sentence:

'This Indian Standard was first published in 1985 and subsequently taken up for revision keeping in view the experience gained and the feedback obtained from the field.'

(Para 4, line 1) — Delete the word 'draft'.

(CHD 019)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 JUNE 1998
TO
IS 11226 : 1993 LEATHER SAFETY FOOTWEAR
HAVING DIRECT MOULDED RUBBER SOLE —
SPECIFICATION

(*First Revision*)

(*Page 1, clause 4, last sentence*) — Substitute the following for the existing text:

‘However, such footwear with modified design may also be made, as agreed to between the purchaser and the supplier.’

(*Page 2, clause 5.2.11, line 6*) — Substitute ‘requirements’ for ‘requirement’.

(*Page 2, clause 5.2.11.2*) — Substitute the following for the existing text:

‘Oil resistant soles and heels conforming to the requirements given in Table 2 shall be used for safety footwear with oil resistant properties, meant for use at workplaces, where there is no chance of oil coming in direct contact with the upper or upper-sole joint.’

(*Page 3, clause 5.4, title*) — Substitute ‘Construction’ for ‘Manufacture’.

(*Page 3, clause 5.4.1, title*) — Delete the title.

[*Page 4, Table 3, Sl No. (ix)*] — Substitute the following for the existing text:

(1)	(2)	(3)	(4)	(5)	(6)
(ix)	Direct moulded rubber sole (finished):				
a)	At fore part	Rubber	14	9	9
b)	Waist	do	9	6	6
c)	At heel	do	35	23	23
d)	Depth of cleat at sole and heel	do	3	3	3

(*Page 4, Table 3, Note*) — Substitute the following for the existing Note:

‘NOTE — The thickness of components except rubber sole, heel and full sock shall be checked (not at skived portion) before lasting of upper.’

Amend No. 2 to IS 11226 : 1993

(*Page 4, clause 5.4.3.2, lines 1 and 2*) — Substitute '20 to 25' for '30 to 35'.

(*Page 4, clause 5.4.4.2, lines 1 and 2*) — Substitute '30 to 35' for '40 to 45'.

(*Page 4, clause 5.4.4.2, lines 2 and 3*) — Substitute '20 to 25' for '30 to 35'.

(*Page 5, clause 5.4.5.2, lines 6 and 7*) — Substitute '30 to 35' and '20 to 25' for '40 to 45' and '30 to 35' respectively.

(*Page 6, clause 5.5.1, line 2*) — Substitute '1 700 g' for '1 400 g'.

(*Page 6, clause 5.5.2, line 2*) — Substitute '1 500 g' for '1 300 g'.

(*Page 6, clause 5.5.3, line 2*) — Substitute '1 450 g' for '1 200 g'.

(*Page 6, clause 5.7.2, last line*) — Insert the words 'sides and' between 'at' and 'heel' and delete the word 'respectively'.

(*Page 8, Annex D*) — Substitute the following for the existing text:

ANNEX D
(*Clause 5.6*)

METHOD OF TEST FOR PERFORMANCE OF SAFETY FOOTWEAR

D-1 GENERAL

The impact test is carried out for determining the performance of safety boots reinforced with steel toe cap to withstand a blow of 14 kgf.m.

D-1.1 Test Specimen

D-1.1.1 The boot shall be tested only after 48 hours of vulcanization/moulding.

D-1.1.2 The test shall be made on the toe of the finished safety boots/shoes, sampled from each size of a lot.

D-1.1.3 Pattern of Boot

The test shall apply only to safety boots and shoes fitted with protective steel toe caps.

D-1.1.4 Preparation of Test Specimen

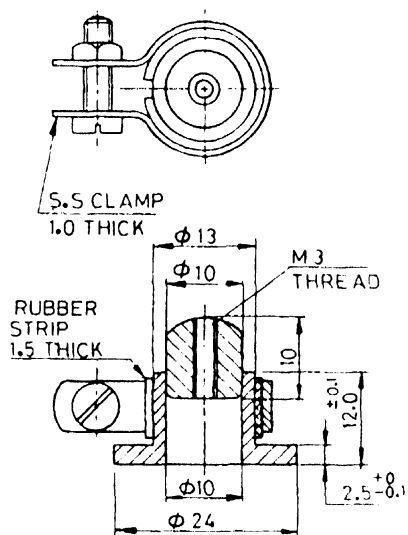
Prepare test specimen from the forepart of the footwear by cutting off the toe end from not more than 30 mm behind the rear edge of the toe cap. The upper and lining shall not be separated.

D-2 APPARATUS

D-2.1 The testing apparatus shall be such that a 27.0 ± 0.2 kg load can be allowed to fall freely on vertical guides from various predetermined heights to strike a cylindrical mild steel plunger, 38 mm in diameter and 145 mm in length. Before carrying out any test, the test apparatus shall be checked for its ability to fall freely without any restriction up to the striking bar at the base of the apparatus. The plunger shall be freely supported in a vertical guide, and shall have attached to its lower end a horizontal mild steel bar 155 mm long, 38 mm wide and 10 mm thick. The bar (strike plate) shall be capable of resting across the toe-cap with its front edge in line with the point of toe-cap. The upper end of the plunger shall have a mild steel plate of 63 mm \times 63 mm, screwed to it, and can be replaced when damaged. The above dimensions shall have a tolerance of ± 1 mm.

D-2.1.1 The base of the machine shall be solidly constructed of hard wood not less than 75 mm thick. To this a metal block (50 mm thick) shall be bolted to support the steel plate on which the boot rests.

D-2.1.2 A capsule as illustrated in Fig. 4 suitable for measuring clearance inside the boot/shoe at the moment of impact shall be used. The capsule consists of a small duraluminium plunger which is depressed on impact into a brass cylinder. The metal clip shall be fastened around a rubber tubing which encases the cylinder and by tightening and loosening the clip the amount of friction between the cylinder and plunger can be varied. The cylinder wall shall be slotted to enable the clip to compress the cylinder on to the plunger. The clip shall be so adjusted that the movement between the two parts takes place at a load of less than 14.0 N, but no movement takes place at a load of 8.0 N.



All dimensions in millimeters.

FIG. 4 CAPSULE FOR MEASURING THE CLEARANCE AT THE
MOMENT OF IMPACT

FIG. 5 ATTACHMENTS FOR FIXING THE CAPSULE

D-3 PROCEDURE

D-3.1 Positioning

Place the capsule in the slot of the stabilization fork and position it close to the rear end of the slot. Then place the test specimen on the clamping base so that the fork tips touch the fore end of its inner lining. The details of a suitable stabilizing fork have been given in Fig. 5A and Fig. 5B. Fix the stabilizing form by means of the clamping screw to rest on the insole. Now adjust both the clamping screw and the adjusting screw so that the stabilizing fork becomes more or less parallel to the base plate and the test piece is clamped firmly (see Fig. 7).

Now, place the clamping device of the impact testing equipment with the securely clamped test piece under the vertical plunger of the performance testing apparatus (see Fig. 6 and Fig. 7).

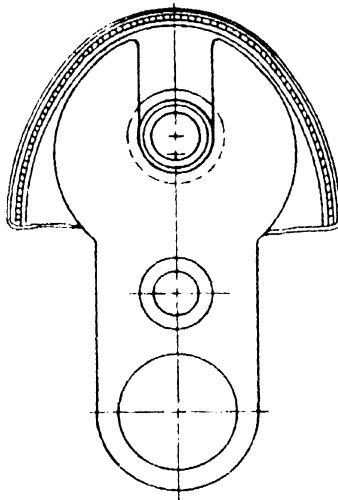


FIG. 6 PLACEMENT OF THE SAMPLE FOR DETERMINATION OF IMPACT VALUE

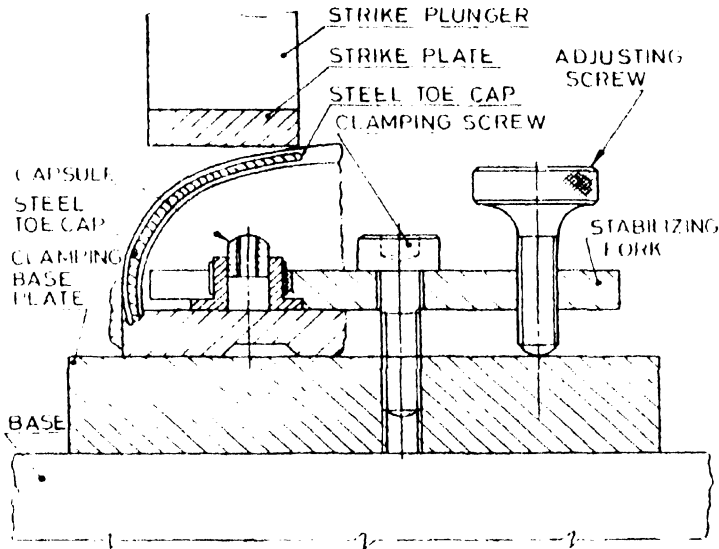


FIG. 7 POSITIONING AND CLAMPING OF THE FOREPART OF THE SAFETY FOOTWEAR

Position the vertical plunger about 1 mm inside the rear edge of the steel toe-cap and under the striking bar so that the capsule is behind the centre line of the bar. The bar shall rest on the boot lengthwise roughly at right angles to the length of the test specimen.

D-3.2 Impact

Adjust the load to a height of 508 ± 5 mm above the top of the vertical plunger (see Fig. 7) and allow it to fall freely and strike the plunger. The impact should be of 14 kgf.m.

Amend No. 2 to IS 11226 : 1993

D-3.3 Measurement

Remove the capsule by unscrewing the adjusting screw (*see* Fig. 5B) and the clamping screw and measure the length from the top of the duraluminium plunger to the base of the capsule by means of a slide caliper fitted with a vernier, capable of measuring the value to the nearest 0.1 mm. This value is the clearance inside the boot/shoe at the moment of maximum depression.

(*Page 10, clause E-1.3.1, first line*) — Substitute 'tester' for 'testor'.

(*Page 10, clause E-1.4.1.2, line 8*) — Substitute 'lack' for 'lake'.

(CHD 019)

Indian Standard

LEATHER SAFETY FOOTWEAR HAVING DIRECT MOULDED RUBBER SOLE — SPECIFICATION

(*First Revision*)

1 SCOPE

This standard prescribes the requirements, methods of sampling and tests for leather safety footwear having steel toe caps and direct moulded rubber soles.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2050 : 1991 shall apply.

4 TYPES

The leather safety footwear having direct moulded rubber soles shall be of following three types depending on their design:

- | | |
|---------------|----------------|
| <i>Type 1</i> | Ankle boots |
| <i>Type 2</i> | Jodhpuri shoes |
| <i>Type 3</i> | Derby shoes |

However such footwear with modified design may also be made, as agreed to the purchaser and the manufacturer.

5 REQUIREMENTS

5.1 Leather safety footwear namely, Ankle boot, Derby shoe pattern or Jodhpuri shoe pattern or similar designs other than these, as agreed to between the manufacturer and the purchaser, shall be made from chrome tanned upper leather with cleated soles and heels with slip-resistant pattern by direct vulcanizing or by direct moulding process.

5.2 Materials

5.2.1 Upper Leather

For upper, full chrome leather conforming to IS 5677 : 1986 shall be used.

5.2.1.1 Unless otherwise specified, the leather shall be black or brown and printed with pebble grain or any print agreed to between the purchaser and the manufacturer.

5.2.2 Insole Material

Leather board conforming to IS 5867 : 1970 shall be used. Chrome fibre board (reconstituted) may also be used if agreed to between the purchaser and the manufacturer.

5.2.3 Stiffener

Stiffener material shall be vegetable tanned sole leather splits conforming to Type 1 of IS 7554 : 1974.

5.2.4 Lining Material

Lining leather conforming to Type 1 or Type 3 of IS 3840 : 1979 shall be used.

NOTE — While checking the conformity of upper leather, stiffener material and lining leathers to the relevant standards mentioned under 5.2.1, 5.2.3 and 5.2.4 respectively, the sampling shall be done in accordance with IS 5868 : 1983.

5.2.5 Threads

Rot-proof cotton sewing threads variety No. 35 conforming to IS 1720 : 1978 and rot-proof linen thread complying with the requirements given in Annex B shall be used for stitching of upper. The colour of the thread used shall be as agreed to between the purchaser and the manufacturer.

5.2.6 Grinders

5.2.6.1 Lasting tacks

Mild steel, rust-proof, 12.0 ± 1 mm and 10.0 ± 1 mm long lasting tacks shall be used.

5.2.6.2 Shanks

Iron shanks conforming to Type 1 of IS 10945 : 1984 shall be used. Where the outer sole design provides equal bridging support, shanks may not be used. An illustration of such a sole design is given in Fig. 1. However any other design of sole with in-built bridging support may also be used.

5.2.6.3 Eyelets

Aluminium or steel eyelets conforming to size (collar diameter) 10 of Table 1 of IS 5041 : 1978 shall be used.

5.2.7 Cotton NEWAR

White, 19 ± 1 mm-wide cotton *NEWAR* (see IS 1895 : 1982) shall be used.

5.2.8 Toe Compound

Gum glue or latex based compound shall be used.

5.2.9 Laces

Fabric laces of colour matching with colour of upper leather shall be provided for boots and shoes. The length shall be 90 ± 5 cm and 60 ± 5 cm for boots and shoes respectively. If agreed to between the purchaser and the manufacturer nylon laces of equivalent grade may also be used. Laces shall also conform to IS 4778 : 1982. Laces if coloured black, shall be free from sulphur dyes, when tested in accordance with the method prescribed in Annex C.

5.2.10 Steel Toe Cap

Steel toe caps of Type 2 of IS 5852 : 1992, with performance requirement 22 mm *Min*, shall be used.

5.2.11 Sole and Heel

The direct moulded rubber sole and heel in the finished footwear shall have an anti-slip design, unless otherwise specified by the purchaser. It shall be free from visible defects, such as blow holes, cuts, cracks, cavities, flash and spew. It shall also conform to the requirement given in Table 1.

5.2.11.1 Typical designs of moulded rubber sole and heel with and without bridging support are given in Fig. 1 and 2 respectively. However the sole may be of any other design as agreed to between the purchaser and the supplier.

5.2.11.2 For the footwear having oil resistant soles and heels conforming to the requirements given in Table 2 shall be used.

5.2.11.3 The direct moulded rubber soles and heels on exposure at $100 \pm 1^\circ\text{C}$ for 72 h and $70 \pm 1^\circ\text{C}$ for 148 under normal atmospheric pressure in an air circulating oven, shall show no sign of hardening, cracking or tackiness.

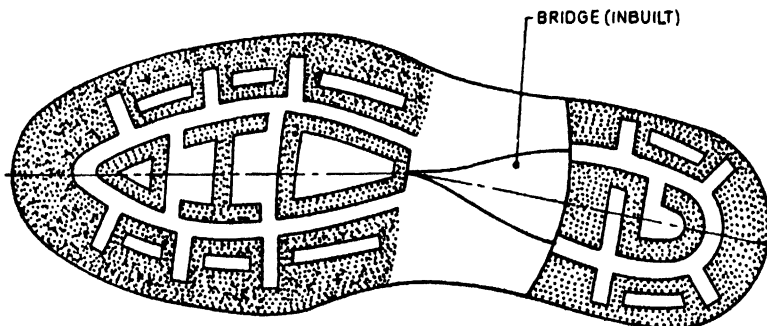


FIG. 1 DESIGN OF A DIRECT MOULDED RUBBER SOLE AND HEEL WITH BRIDGING SUPPORT

Table 1 Requirements of Direct Moulded Rubber Soles and Heels

(Clause 5.2.11)

Sl No.	Characteristic	Requirement	Method of Test, Ref to IS
(1)	(2)	(3)	(4)
i)	Relative density, <i>Max</i>	1.30	3400 (Part 9) : 1978
ii)	Hardness, Shore A,	70 ± 5	3400 (Part 2) : 1980
iii)	Tensile strength, MPa, <i>Min</i>	10.5	3400 (Part 1) : 1987
iv)	Flexing resistance		3400 (Part 16) : 1974
	a) Number of cycles for initial crack, <i>Min</i>	60 000	
	b) Cut growth at the end of 1 20 000 cycles, percent, <i>Max</i>	400	
v)	Change in initial hardness, Shore A, after ageing at $100 \pm 1^\circ\text{C}$ for 24 h	+5 -0	3400 (Part 4) : 1987 and
vi)	Elongation at break, percent, <i>Min</i>	250	3400 (Part 2) : 1980 3400 (Part 1) : 1987

NOTES

- 1 If the heels are compounded from same mix of soles, then it may not be tested for Sl No. (iv) and (vi).
- 2 Reading from 30 to 95 in Shore durometer, Type A are approximately same as those in IRHD.

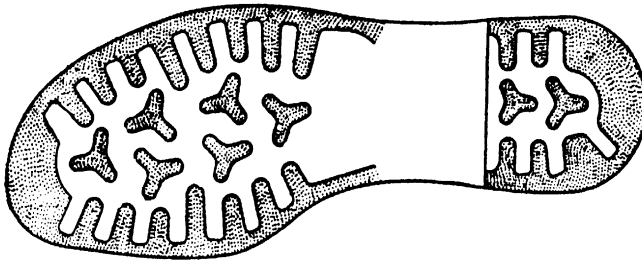


FIG. 2 DESIGN OF A DIRECT MOULDED SOLE AND HEEL

Table 2 Requirements of Rubber Soles and Heels with Oil Resistance Properties
(Clause 5.2.11.2)

Sl No.	Characteristic	Value without Heat Ageing	After Ageing at 100 ± 1°C for 70 h in Air Oven, Max (Change from Original)	Method of Test, Ref to IS
(1)	(2)	(3)	(4)	(5)
i)	Hardness, Shore A	70 ± 5	± 5 Shore A	3400 (Part 2) : 1980
ii)	Tensile strength, MPa, Min	8.5	[+ 15 percent — 0 percent	3400 (Part 1) : 1987
iii)	Elongation at break, percent, Min	200	[+ 0 percent — 30 percent	3400 (Part 1) : 1987
iv)	Relative density, Max	1.3	[+ 0 percent — 30 percent	3400 (Part 9) : 1978
v)	Oil resistance to liquids: a) iso-octane and toluene mixture in the ratio of 85 : 15 for 24 hours at 27 ± 2°C, change in volume, percent b) Mineral oil, hydraulic, buffer change in volume, percent	— 5 to + 15 — 3 to + 5		3400 (Part 4) : 1987
vi)	Flexing resistance a) Number of cycles for initial crack, Min b) Cut growth at the end of 1 20 000 cycles, percent, Max	60 000 400		3400 (Part 16) : 1974

5.3 Components

Material and thickness requirements for various components shall be as given in Table 3.

5.4 Manufacture

5.4.1 Construction

The footwear shall be made by direct vulcanizing or direct moulding process.

5.4.1.1 Design

Similar designs other than those illustrated in Fig. 3 (A, B and C) may be accepted as agreed to between the manufacturer and the purchaser.

NOTE — The illustrations are diagrammatic only and are not included to illustrate all details or designs.

5.4.2 All the components of the footwear shall be cut to the material and thickness require-

ments given in Table 3. All components shall be free from grain damages, flay cuts, wrinkles and other visual defects.

NOTE — For guidance to the manufacturers, correct locations for cutting of components are indicated in col 3 of Table 3.

5.4.2.1 All the upper components, specially vamp and tongue, shall be properly skived.

5.4.3 Upper Closing for Type 1

5.4.3.1 All the upper components shall be stitched by lock stitching machine using thread of variety No. 35 for counter, back of the quarters faces as sides of the quarter and toe cap. The thread mentioned may be substituted by linen threads of 5 ply, if required by the purchaser. Nylon thread of equivalent grade may also be used for this purpose as agreed to between the purchaser and the manufacturer.

Table 3 Requirement of Components for Leather Safety Footwear Having Direct Moulded Rubber Soles*(Clauses 5.3 and 5.4.2)*

Sl No.	Component	Material	Thickness, mm, Min (at the cross section at centre)		
			Type 1 (4)	Type 2 (5)	Type 3 (6)
(1)	(2)	(3)			
i)	Vamp	Prime part of full chrome upper leather (butt portion)	1.5	1.5	1.3
ii)	Toe cap outside counter and jugloop	-do-	1.2	—	1.2
iii)	Quarter	Rest of the portion from upper leather except shanks	1.5	1.5	1.0
iv)	Tongue	-do-	1.0	1.0	1.0
v)	Vamp lining	Lining leather to withstand vulcanizing temperature	0.8	0.8	0.8
vi)	Quarter lining	-do-	0.8	0.8	0.8
vii)	Full sock	Pigmented splits	0.8	0.8	0.8
viii)	Insole	Leather Board/Chrome fibre board (reconstituted)	2.5	2.5	2.5
ix)	Direct moulded rubber sole (finished):				
	a) at fore part	Rubber	14.0 ± 1	12.0 ± 1	12.0 ± 1
	b) at waist	-do-	9.0 ± 1	7.0 ± 1	7.0 ± 1
	c) heel (finished)	-do-	35.0 ± 1	33.0 ± 1	33.0 ± 1
x)	Heel filler	Pulp or fibreboard or light wood	10.0	8.0	8.0

NOTE — The thickness (not at skived portion) except full sock shall be checked before moulding/ vulcanization.

5.4.3.2 The number of stitches shall be 30 to 35 per decimetre and in two rows, about 3 mm apart, on the toe caps and counters and two rows, about 5 mm apart on sides. The distance between the two rows of stitching at the quarter facing shall not exceed 2 mm. The first row of stitching shall be approximately 3 mm from edge of the quarter facing. All loose ends of threads shall be properly secured.

5.4.3.3 The back seam of the quarters shall be reinforced with a *NEWAR* as specified in 5.2.7. The joined top of the quarter shall be strengthened by means of 25 ± 1 mm wide leather strap at the back.

5.4.3.4 The counter shall be turned over within 15 mm at the top of the leg so as to form a jugloop.

5.4.3.5 Unless otherwise agreed to between the purchaser and the manufacturer the tongue shall have full bellows and properly fitted so that wrinkles do not occur where it is joined to the vamp.

5.4.3.6 Six eyelets shall be fitted equidistantly in each face, each eyelet being properly clenched without any distortion.

5.4.4 Upper Closing for Type 2

5.4.4.1 The upper shall be machine closed on lockstitch machine using cotton thread of variety No. 35 for sides and variety No. 30 for other portions. The thread mentioned may be substituted by linen threads of 5 ply, if required by the purchaser.

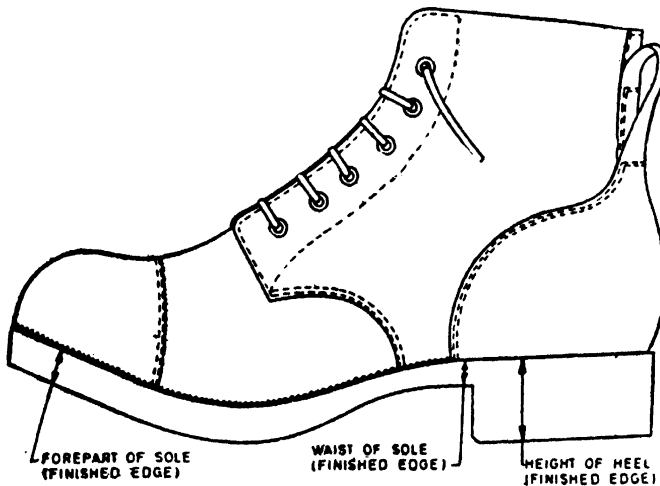
5.4.4.2 The number of stitches shall be 40 to 45 per decimetre for cotton thread and 30 to 35 per decimetre for linen thread. There shall be two rows of stitches about 4 mm apart on sides of quarters. All other stitches shall be in single row.

5.4.4.3 Back seam stitches shall be reinforced with *NEWAR* tape and top of quarters shall be reinforced with lining leather. In absence of *NEWAR* back seam shall be stitched with zigzag stitching.

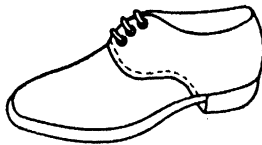
5.4.4.4 Two eyelets shall be fitted equidistantly in each face, each eyelet being properly clenched without any distortion.

5.4.5 Upper Closing for Type 3

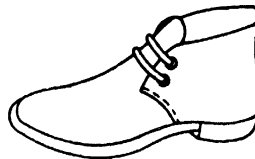
5.4.5.1 The upper shall be machine closed on lockstitch machine using cotton thread of



3A ANKLE BOOT



3B DERBY SHOE



3C JODHPURI SHOE

NOTE — The illustrations are diagrammatic only and are not included to illustrate all details or designs.

FIG. 3 DIRECT MOULDED BOOTS AND SHOES

variety No. 35, for sides and variety No. 30 for other portions. The thread mentioned may be substituted by linen threads of 5 ply, if required by the purchaser.

5.4.5.2 There shall be two rows of stitches on the toe cap about 4 mm apart, two rows on the facing about 1.5 mm apart and three rows on the sides about 3 mm apart. The remaining stitches shall be in single row. The number of stitches shall be 40 to 45 per decimetre for cotton thread and 30 to 35 per decimetre for that of linen thread.

5.4.5.3 Three eyelets shall be fitted equidistantly in each face, each eyelet being properly clenched without any distortion.

5.4.6 Lasting

5.4.6.1 The upper shall be tack lasted with a clear lasting allowance of approximately 13 mm for Type 1 and Type 2 and 10 mm for Type 3 all round.

5.4.6.2 The stiffener shall be included in the lasting. Prior to lasting steel toe cap shall be placed between leather toe cap and vamp lining to the exact shape and contour of the last. The steel toe cap shall have reinforced edges at the bottom to hold the insole.

5.4.6.3 Shanks shall be attached to the waist covering about 25 mm under the heel.

The lasted margin shall be roughened properly all round and suitable adhesive applied uniformly. Fibre board, pulp board or light wood shall be used as heel filler before moulding of soles.

5.4.7 Moulding of Rubber Soles

Rubber soles shall then be moulded on the lasted upper by high pressure vulcanizing or moulding machine. Care shall be taken to see that no air bubbles remain inside the rubber moulds and all portions are uniformly vulcanized or

moulded. The moulding flash at the sole and heel shall be neatly trimmed.

5.4.7.1 A full sock shall be pasted down neatly on the insole of each footwear.

5.4.8 Workmanship and Finish

The footwear shall be free from injurious folds and wrinkles in the upper, trapped air, blisters, embedded foreign matter, excessive surface markings caused by dirty and damaged moulds.

5.4.8.1 The finish shall be in accordance with sound manufacturing practice. The footwear shall be properly finished and each pair shall be provided with one pair of fabric lace.

5.4.8.2 The leg height of Type 1 boots shall be 150 ± 2 mm (both odds of a pair shall be equal in height) for size 8 and shall increase or decrease by 2 mm from size to size. The heel height shall be 35 ± 1 mm for all sizes.

5.4.8.3 The leg height of Type 2 shoes shall be 100 ± 2 mm (both odds of a pair shall be equal in height) for size 8 and shall increase or decrease by 2 mm from size to size. The heel height shall be 33 ± 1 mm for all size.

5.4.8.4 Leg height of the footwear having design other than those given in Fig. 3 (A, B and C) shall be as agreed to between the purchaser and the supplier.

5.4.8.5 The heel height of Type 3 shoes shall be 33 ± 1 mm for all sizes.

5.5 Mass

5.5.1 The mass of Type 1 boots shall not exceed 1 400 g per pair of size 8. The mass of boots shall increase or decrease by 100 g per pair for bigger or smaller sizes respectively.

5.5.2 The mass of Type 2 shoes shall not exceed 1 300 g per pair of size 8. The mass of such shoes shall increase or decrease by 100 g per pair for bigger or smaller sizes respectively.

5.5.3 The mass of Type 3 shoes shall not exceed 1 200 g per pair of size 8. The mass of such shoes shall increase or decrease by 100 g per pair for bigger or smaller sizes respectively.

5.5.4 Mass of the footwear having design other than those given in Fig. 3 (A, B and C) shall be as agreed to between the purchaser and the supplier.

5.6 Performance Test

The safety boots and shoes when subjected to the impact test prescribed in Annex D shall withstand a blow of 14 kgfm. Further the

clearance inside the boots and shoes at the moment of maximum depression when subjected to an impact test shall be 13.5 mm or more.

5.7 Adhesion Test on Moulded Bottoms

5.7.1 Carry out the adhesion test after a lapse of at least 72 hours on the completion of moulding or vulcanizing and after allowing the footwear to cool down to room temperature.

5.7.2 There shall be no visible parting of the bottoms from the upper at a load of 27 kg at toe and 35 kg at the sides and at heel seat of ankle boot when tested for adhesion in accordance with Annex E. For Jodhpuri shoe and Derby shoes the load shall be 25 kg at toe and 30 kg at heel seat respectively.

6 SAMPLING

The scale of sampling of footwear, the method of their selection and the criteria for conformity shall be as prescribed in IS 2051 : 1976.

7 MARKING

7.1 Sizes of the footwear and trade-mark, if any, shall be incorporated in the mould, so as to make them legible on the waist of the outer-sole. Size and fitting number, and year of manufacture shall be marked on insole waist and also be legibly marked on the full sock.

7.1.1 The footweares shall also be marked with the following details:

- a) Batch No., and
- b) Month and year of manufacture.

8 PACKING

8.1 Unless otherwise agreed to, the packing specified in 8.1.1 shall be followed.

8.1.1 The footwear shall be packed in wooden packing cases of adequate size so as not to spoil the shape of the footwear and lined with waterproof (bituminized kraft paper) packing paper.

8.1.2 The package shall be legibly marked with following:

- a) Name of the material;
- b) Name of the manufacturer or its recognized trade-mark, if any;
- c) Batch/code No.; and
- d) Size and quantity of pairs packed.

8.1.3 The packages shall be marked with green colour if safety footweares are meant for oil-refineries.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	Title	IS No.	Title
1720 : 1978	Specification for cotton sewing thread	4778 : 1982	Specification for cotton laces for footwear
1895 : 1982	Specification for cotton <i>NEWAR</i> (<i>first revision</i>)	5041 : 1978	Specification for footwear and stationery eyelets (<i>first revision</i>)
2050 : 1991	Glossary of terms relating to footwear (<i>first revision</i>)	5677 : 1986	Specification for shoe upper leathers for direct moulding process
2051 : 1976	Leather footwear, methods for sampling of (<i>first revision</i>)	5852 : 1992	Protective steel toe caps for footwear (<i>second revision</i>)
3400 (Part 1) : 1987	Methods of test for vulcanized rubbers : Part 1 Tensile stress and strain properties	5867 : 1970	Specification for leather board
3400 (Part 2) : 1980	Part 2 Hardness	5868 : 1983	Method of sampling for leather
3400 (Part 4) : 1987	Part 4 Accelerated ageing	6368 : 1971	Method for sampling of rubber and rubber combination footwear
3400 (Part 9) : 1978	Part 9 Density	7554 : 1974	Specification for stiffeners
3400 (Part 16) : 1974	Part 16 Measurement of cut growth of rubber	10945 : 1984	Shanks for footwear
3840 : 1979	Specification for lining leathers (<i>first revision</i>)		

ANNEX B

(Clause 5.2.5)

REQUIREMENTS FOR LINEN THREAD

B-1 REQUIREMENTS

of direct moulded rubber sole ankle boots shall be as given in Table 4.

B-1.1 Requirements for different types of linen thread used for stitching of various components

Table 4 Requirements for Linen Thread

(Clause B-1.1)

Sl No.	Thread	Count (Tex)	Piles	Direction of Twist	Minimum Breaking Load in kg on 50-cm Grip Length with the Rate of Traverse of Power — Actuated Grips Being 30 cm/Min
(1)	(2)	(3)	(4)	(5)	(6)
i)	Linen	92 (or 18 s)	5	Z/S	11.0

ANNEX C

(Clause 5.2.9)

METHOD FOR DETECTION OF SULPHUR DYES IN BLACK COLOURED LACES

C-1 PROCEDURE

C-1.1 Boil the laces in alkaline hydrosulphite solution for one minute. If the shade is reduced to pale brown or yellow colour and on oxidation restored to the original colour, sulphur dyes shall be suspected to be present.

C-1.2 For confirmation, boil the laces in acid stannous chloride solution in a test tube covered with a piece of filter paper moistened with lead acetate. A blackish/brown stain with metallic lustre confirms the presence of dyes.

ANNEX D

(Clause 5.6)

DETERMINATION OF IMPACT VALUE OF PROTECTIVE STEEL TOE CAP

D-1 GENERAL

D-1.1 An impact test for determining the performance of toes of protective boots and shoes reinforced with steel toe cap to withstand a blow of 14 kgfm is described.

D-2 REQUIREMENTS

D-2.1 Test Specimen

The boot or shoe shall be tested only after 24 hours of its manufacture.

D-2.2 The test shall be made on the toe of finished footwears sampled from each size of a lot.

D-3 TEST MACHINE

D-3.1 The test machine shall be such that a 27 ± 0.2 kg mass can be allowed to fall freely on vertical guides from various predetermined height to strike a cylindrical mild steel plunger 38 mm in diameter and 145 mm long. The plunger shall be freely supported in a vertical guide, and shall have attached to its lower end a horizontal mild steel bar 115 mm long, 38 mm wide and 10 mm thick. The bar shall be such that it rests on the toe of the boot or shoe in a position specified in **D-5.1**. The upper end of the plunger shall have a mild steel plate 63 mm wide, screwed to it which can be replaced if worn out. The above dimensions shall have a tolerance of ± 1 mm.

D-3.1.1 The base of machine shall be solidly constructed of hardwood 75 mm thick. To this shall be bolted a metal block 50 mm thick to support the steel plate on which the boot or shoe rests (see **D-5.2**). The mass of the machine

excluding the striker shall be 65 ± 5 kg. The machine shall be free standing or a flat end level flow which is sufficiently massive and rigid to be immovable under the condition of test.

D-4 MEASUREMENT OF IMPACT VALUE

D-4.1 Point of Measurement of Clearance Inside the Boot or Shoe

The position for point of measurement of clearance inside the boot or shoe shall be found by using a size 8 last of the same shape as that on which the boot or shoe to be tested was made (see Fig. 4). The toe point is found by placing the last on a flat surface so that its inside surface and toe touches two vertical planes at right angles to each other. X is the point of contact of the toe with one of these planes. A line Xy is drawn from toe to heel (the heel point can be located by eye with sufficient accuracy) and 28 mm is marked off down this line from the toe to get point A . A line perpendicular to Xy is drawn through A cutting the outside edge of the last at P and the inside edge at Q . O is then marked so that $OQ = 0.42 X PQ$.

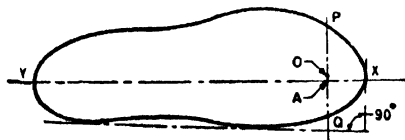


FIG 4 POSITION FOR MEASUREMENT OF CLEARANCE INSIDE THE BOOT OR SHOE

D-4.1.1 The boot or shoe to be tested shall be drilled through the sole in such a manner that with the last in the boot or shoe the drill comes through the inside at the point *O* on the last, and is approximately perpendicular to the surface of the last at that point. A suitable jig can be devised for this purpose.

D-4.2 Method of Measurement of Clearance at the Moment of Maximum Depression

A device capable of measuring the clearance at the moment of maximum depression, between the insole and upper, shall be fixed to the insole by means of screw passing through the hole drilled in the position defined in **D-4.1.1**. A suitable measuring device is shown in Fig. 5.

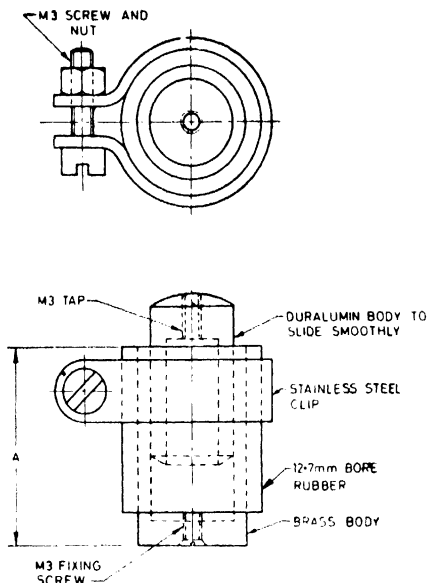


FIG. 5 CAPSULE FOR MEASURING THE CLEARANCE AT THE TIME OF MAXIMUM DEPRESSION

D-5 PROCEDURE

D-5.1 Clamping of Boot or Shoe

The boot, or shoe, with the measuring device inserted shall be lightly clamped so that it can not move longitudinally or laterally, with it toe part of the flat horizontal steel plate. The angle of the boot or shoe shall be such that the forward 65 mm of the sole is judged by the operator to be on the average horizontal, and the boot or shoe shall be supported in this position by a wedge under the heel, the wedge being such that it supports only the heel and no part of the sole.

D-5.2 Position of Boot or Shoe

The boot or shoe clamped as specified in **D-5.1** shall be positioned under the striking bar so that the measuring capsule is 10 mm behind the centre line of the bar. The bar shall rest on the boot or shoe with longest direction roughly at right to the length of the boot or shoe.

D-5.3 Adjust the mass to a height of 500 ± 5 mm above the top of the vertical plunger as specified in **D-3.1** and allow it to fall freely. This gives the mass an impact of 14 kgf/m as required.

D-6 ASSESSMENT OF IMPACT VALUE

C-6.1 If the clearance inside the boot or shoe at the moment of maximum depression is 13.5 mm or more, the boot or shoe shall be declared to have passed the test. If the clearance is less than 13.5 mm, the boot or shoe shall be declared to have failed. If, however, the clearance of the three boots or shoes tested is either 13.0 mm or more and the figure for none of the three boots or shoes falls below 12.7 mm the boots or shoes shall be declared to have passed the test.

ANNEX E

(Clause 5.7.2)

METHOD OF TEST FOR ADHESION STRENGTH

E-1 ADHESION TEST ON VULCANIZED BOTTOM**E-1.1 Outline of the Method**

The purpose of this test is to measure the adhesion strength between the stuck-on and moulded-on soles and the uppers to ensure satisfactory adhesive bond, in order to avoid premature failure of the footwear.

E-1.2 Conditioning

E-1.2.1 The properties of vulcanized moulded rubber change continuously with time particularly during first 24 to 48 hours from vulcanization moulding.

E-1.2.2 Protect the samples of test pieces from light as completely as possible during the interval between vulcanization/moulding and testing.

E-1.2.3 Condition the samples at $27 \pm 2^\circ\text{C}$ for at least 12 hours and keep at this controlled temperature till tested.

E-1.3 Apparatus**E-1.3.1 Adhesion Tester**

SATRA sole adhesion tester or its equivalent for measuring the toe and heel adhesion strength. The instrument consists of anvils, toe pieces with packing pieces provided to adjust the height of the anvil to suit the sole thickness and a load-measuring beam to record the load applied.

E-1.4 Procedure**E-1.4.1 Adhesion of Toe**

Select the pressure block and the piece which conform to the shape of the toe of the footwear sampled for testing and attach it at the end of the load-measuring beam. Adjust the height of the anvil to suit the sole thickness, using the packing pieces provided, so that the forepart of the sole be horizontal or tends slightly downwards towards the toe. Check the zero of the load gauge for correctness and avoid any error.

E-1.4.1.1 Place the footwear which last on the anvil and insert the toe piece of the instrument in the feather line groove between sole and upper. Grasp the footwear firmly and press

down on the back of the last to increase the load steadily. Apply the load in such a manner so that the test is completed in about 5 seconds. Push the footwear hard against the pressure block (at the time of applying load) to prevent the toe of the footwear from slipping out of the toe piece of the instrument.

E-1.4.1.2 Read the load on the measuring beam of the instrument when the sole develops a tendency of separation from the upper. Record the reading as maximum value, as the load starts dropping after this value when further separation takes place. Examine and record the type of separation, whether, tearing or failure in material (upper/sole) lake of adhesion to material, cohesive failure of the adhesive or incomplete coalescence of the adhesive.

E-1.4.2 Adhesion at Heel

Remove the anvil from the base of the instrument and fix up the stirrup attachment properly required for this test. Select the toe piece of the instrument which conform to the curvature of the heel and attach it to the load beam.

E-1.4.2.1 Place the heel of the footwear in the stirrup, so that its rear touches the toe piece. Adjust the toe piece and level it with the groove between the heel and upper. Raise the footwear and add one or more stirrup packing pieces between the heel and stirrup till correct height is obtained. Insert the toe piece in the groove between the heel and upper. Apply load in such a manner that the test is completed in 5 seconds.

E-1.4.2.2 Read the load on the measuring beam of the instrument when the heel starts separating from the upper. Record the load and examine as described in **E-1.4.1.2**

E-1.5 Reporting

Report the observations as follows and verify its compliance with 4.7.2.

- a) Adhesion value,
- b) Type of test piece,
- c) Duration of test.
- d) Period of test, and
- e) Pass/type of failure.

ANNEX F (Foreword)

COMMITTEE COMPOSITION

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Member Secretary
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Joint Director (Chemical), BIS

(Continued on page 12)

(Continued from page 11)

Composition of Industrial Safety and Special Purposes Footwear Subcommittee, CHD 019 : 04

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